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DESCRIPTION
OF THE
LANDS AND MINES
OF THE
GREAT WESTERN COPPER MINING CO.
OF LAKE SUPERIOR.

Chartered

BY THE GENERAL INCORPORATION LAWS OF THE STATE OF MICHIGAN.

REPORTS AND MAPS

BY

PROFESSORS J. W. FOSTER AND J. W. WHITNEY,

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AND

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1852.

GREAT WESTERN Copper Mining Company.

CAPITAL STOCK,

10,000 Shares, \$100—\$1,000,000,

To be disposed of as follows, viz :

For purchase of lands and estates,	-	-	\$300,000
For working capital,	-	-	200,000
			<hr/>
			\$500,000

To be retained by the Company as the property of the Company, and sold for account of the stockholders, pro rata, when ordered by vote of two-thirds of the whole number of shares,	}	\$500,000
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		\$1,000,000

Organized under the general Corporation Laws of the State of Michigan, for forming companies for mining, smelting, and manufacturing copper, silver, and iron ores, passed April 8, 1851.

LANDS AND MINES OF THE COMPANY.

3,790 acres selected mineral lands, located as follows, viz:

1.	160	acres	S. east $\frac{1}{4}$ of section 30,	township 51, N. range 37 W.					
2.	160	do	S. west $\frac{1}{4}$ of "	29	do	"	do	"	"
3.	320	do	south $\frac{1}{2}$ of "	10	do	58	do	28	"
4.	320	do	west $\frac{1}{2}$ of "	9	do	"	do	"	"
5.	320	do	west $\frac{1}{2}$ of "	8	do	"	do	"	"
6.	160	do	S. west $\frac{1}{4}$ of "	12	do	58	do	29	"
7.	160	do	N. east $\frac{1}{4}$ of "	17	do	"	do	"	"
8.	320	do	south $\frac{1}{2}$ of "	2	do	52	N. of R.	36	"
9.	640	do	all	"	11	do	"	do	"
10.	320	do	south $\frac{1}{2}$ of "	1	do	"	do	"	"
11.	160	do	N. east $\frac{1}{4}$ of "	1	do	"	do	"	"
12.	80	do	S. $\frac{1}{2}$ of N. W. $\frac{1}{4}$ "	1	do	52	do	36	"
13.	160	do	S. west $\frac{1}{4}$ of "	36	do	53	do	"	"
14.	488	do	west $\frac{1}{2}$ of "	6	do	52	do	35	"
		do	S. east $\frac{1}{4}$ of section 6		do	"	do	35	"
15.	30	60-100	Lot No. 3	"	30	do	54	do	36
16.	78	40-100	acres, " 1 & 2 "	11	do	53	do	37	"

2,277 acres, located in Elm River District.

320 acres located in *Ontonogan* district, known as the great western mines, and are a continuation of the same veins as the *Adventure* and *Minnesota* mines, now being successfully worked and dividend paying this year. See Foster and Whitney's report, 31st Congress, 1st Session, Ho. Rep., Doc. 69, page 158 to 163. .

1,280 acres located in the *Keewenaw* district, estimated by Professors J. J. W. Foster and J. D. Whitney, as the best mineral district for copper mines in the whole of the Lake Superior country.—See *Foster & Whitney's Report*, 31 Congress, 1st Session, Ex. Doc. No. 69, pp. 96 and 97.

RECAPITULATION.

- No. 1. to 2.—220 acres, *Ontonogan* District.
 No. 3. to 7.—1,280 acres, *Keewenaw* District.
 No. 8. to 16.—2,277 acres, *Elm River* District.

3,777 acres, all mineral land.

(The "*Eagle Mining Company*," now at work, and owning the west end of one of the veins in section 10, near the line of section 11, have sunk a shaft 60 feet; the vein is $3\frac{1}{2}$ feet wide, one foot wider than *Cliff* mine veins, walls well defined and perfectly smooth, good barrel and stamp work, with some large pieces of native copper, of a crystalized, open, comby nature, resembling a portion of the "*Cliff Mine*" vein.)

There has also been discovered on the Elm River tract, pure Galena lead ore, on the lowland north of the copper range; those tracts also contain a good water-power, and an abundant supply of fine building and mining timber. Exploring parties, having ascertained the value of the mineral lands surrounding and adjoining those tracts, have purchased them all.

The lands named as the property of the *Great Western Mining Company* are located in the counties of Ontonogan and Houghton, State of Michigan, on the upper peninsula, on the southern shore of Lake Superior. Tracts No. 3, 4, 5, 6, and 7, are in Houghton county, from 3 to 6 miles south and west of Copper Harbor, and occupy the same position as the celebrated "*Cliff Mine*" and other veins of Keewenaw point, the mineral range of bluffs running nearly east and west, and the veins crossing it at nearly right angles, in a north and south course, and their dip nearly perpendicular. Tracts No. 8, 9, 10, 11, 12, 13, and 14, also in Houghton county, are about 7 miles in direct line, a south-east course from the mouth of Misery River, in Misery Bay. The mineral range of bluffs run nearly north-east and south-west; the veins also run the same way—their course differing from those before mentioned, their dip also being 50° N. W., tracts Nos. 15 and 16 being at the mouths of Misery and Elm rivers, on Misery Bay, on one of which is erected a small warehouse for shipping purposes.

The tracts Nos. 1 and 2, in Ontonogan county, are about 15 miles in a south-easterly direction from the Ontonogan River, occupying the same relative position as the *Minnesota* and *Adventure* mines, with the same bluffs and veins continued. The veins dip 50° N. W., running parallel with the bluffs, N. E. and S. W.; and there are also veins cutting the bluffs, nearly at right angles North and South.

These various tracts have been selected by *Mr. Harrington*, while for five years he *resided* in the Lake Superior country, (as financial agent of the *Cliff* or "*Pittsburg and Boston*" Mining Company over three years;) and after having obtained, by exploring, a thorough knowledge of the country, each tract has been explored by him and his agents sufficient to develop one, two, or more valuable veins of native copper in each tract.

In the explorations, the veins have been traced by cross-cuts and shafts, several hundred feet on some, and two miles on others, in the trap or amygdaloidal rock, and found *regular* and well defined, having smooth walls, and from 2 to 2½ feet wide; they are composed of limespar, quartz, laumonite, chlorite, phrenite, epidote, and native *copper*. Houses have been erected on a number of these tracts, and roads cut and portions of the land cleared. The lands contain an abundance of good timber for building and mining purposes, five of which tracts are convenient to a good harbor, the best on the lake, known as Copper Harbor. The *veins* of native copper compare well with those of the well-known and celebrated *Cliff mine*, and will probably prove as valuable in being worked.

The lands were selected for their mineral veins, but notwithstanding, they are well suited for agriculture as any in that climate, and well timbered.

MIDDLEBURY, (Vermont,) 11th July, 1853.

SIR,—I have examined with some care the papers submitted by you, describing the several mineral tracts in the Lake Superior land district, which have been secured by Mr. Harrington. These tracts, for the most part, are situated in what I regard as the best portion of the mineral region, and I doubt not that some of them, on careful exploration, will be found to contain highly productive veins. Mr. Harrington himself is a good practical explorer, and has passed several years in that region.

Very respectfully,

Your obedient servant,

J. W. FOSTER.

U. S. Geologist and Mineralogist for Lake Superior.

Report of A. Rudolph, Geologist and Mineralogist, on the Elm River Tracts, numbered 8, 9, 10, 11, 12 and 13.

EAGLE RIVER, (Lake Superior,) September 25th, 1851.

MR. F. P. HARRINGTON,

DEAR SIR,—The tracts of land you own on Elm River, and on which, by your request, I submit to you, after a careful examination, the following report, comprises :

- I. The following portions of Sect. 36, Township 53, N. R. XXXVI. W.

The N. W. Quarter.

The West half of the N. E. Quarter.

The S. W. Quarter.

- II. Of Sect. 6, Township 52, N. Range, XXXV. W.

The N. W. Quarter.

The S. W. “

The S. E. “

- III. Of Sect. 1, Township 52, N. Range, XXXVI. W.

The South halves of the N. E. and N. W. Quarters.

The S. E. Quarter.

The S. W. “

- IV. Of Sect. 2, same Township and Range.

The S. E. Quarter.

The S. W. “

- V. Of Sect. 11, Township and Range as before.

The 4 Quarters.

This Elm River tract is situated about $8\frac{1}{2}$ miles S. E. from the mouth of Misery, and 9 miles S. S. E. from the mouth of Elm River. The only one of the adjoining sections on which mining operations, though on a small scale only, are commenced, is sect. 10, and bordering on the West line of sect. 11; this sect. 10 location is known by the name of “Eagle Location.”

The Elm River tract is drained by two rivers, which empty into the lake, by Elm and Misery Rivers—the latter would be navigable for large batteaux for about five miles, if the large amount of timber that obstructs the channel were removed. Three branches of Misery River run through the north half of sec. 11, in a nearly S. W. course; two of these

branches are of considerable size, with several falls and cascades, and offer excellent water power; one large branch of Elm River crosses through the centre of the N. W. quarter of sect. 1, almost N. and S., runs through the S. W. quarter of sect. 36 nearly diagonally, and through the centre of the west-half of the N. E. quarter of the same section. In the south half of sect. 6 lies a lake, which occupies the largest portion of it; this lake is of an elliptic shape, near $\frac{3}{4}$ of a mile long and $\frac{1}{3}$ of a mile wide; it is surrounded by two tamarack swamps, except on the S. E. side, where it is bordered by a low bluff running N. E.

Several ranges of bluffs run through this tract of land; they are in their main course nearly parallel with each other, running about N. E. and S. W. The largest of these bluffs runs in a N. E. course through the following sections: The N. W. quarter of section 11; the S. E. corner of the S. W. quarter of sect. 2; the S. E. quarter of section 2; the N. W. quarter of sect. 1; the S. W. quarter of sect. 36, and still continuing in the next S. E. quarter. The height of this range of bluffs is not great, but very regular; it slopes gradually to the N. W. and S. E. and is in a few places broken by transverse ravines, the declivities of which are steep and rocky. I will designate this bluff with No. I. Three other ranges of bluffs, parallel with the one already described and south of it, run through section 11. The bluffs No. II. are higher and less regular than No. I.; their sides vary from a gradual slope to precipitous descents; they are also intersected by transverse breaks with steep sides. The bluffs No. III. are high and precipitous, the summit even, and of regular height; this bluff also is intersected by several depressions and ravines. The No. IV. bluff is lower than the last one, and resembles in its features the bluffs No. I.; it intersects sect. 11 in the S. E. corner.

The most prominent elevations of sect. 2 are, first—The continuation of bluffs No. I. and V., a short and isolated bluff near the N. E. corner of the S. E. quarter. It runs in conformity with the rest of the bluffs, N. E. and S. W.; towards N. E., S. W. and S. E. it rises gradually from the surrounding level country, to a height of about 60 feet; its N. W. declivity is steep, and in some places precipitous. A bluff of considerable elevation,

and irregular width, bluff No. VI., rises near the centre of sect. 1, and runs in a N. E. course across the township line into sect. 6, where but a short distance east of the line it descends with a precipitous, almost perpendicular, rocky declivity, only sloping near the base gradually towards the lake. This range consists of several ascents, some steep and rocky, some of a gradual slope. But a few low depressions and flat ravines intersect the very irregular height of these bluffs, a spur of which shoots off into sect. 6 and runs through the entire N. W. quarter of it in a N. E. course. This spur is intersected by a deep ravine not far E. of the township line, through which runs a small stream almost due S. into the lake. East of this creek the bluffs don't regain their former altitude; and their sides slope gradually towards the lake S. and towards the N. Another low and short bluff crosses the S. E. corner of sect. 1, besides the continuation of the No. I. bluff of sect. 11, which crosses in the N. W. quarter of sect. 1. The land between these last bluffs and bluff No. IV. is level and swampy. The continuation of bluffs No. I. of sect. 11 is the only one of importance in sect. 36, where it runs diagonally through the S. E. corner of the S. W. quarter, and still extends into the adjoining S. E. quarter of sect. 36. The greatest portion of the land between these different bluffs is level, and covered with a rich and deep soil, on which is a beautiful growth of maple, oak, birch, ash and ironwood; on the bluffs grew the Norwegian pine, hemlock and balsam, and cedar and tamarack in the swampy bottoms. With the exception of the largest portion of the N. W. quarter of sect. 36, and the N. W. corner of the S. W. quarter of sect. 2, which are occupied by sandstone, the whole extent of Elm River location lies within the trap range, which is here composed of three varieties of trap rock, viz:—Hard, compact and crystalline greenstone, grey compact trap and amygdaloid trap, alternately interlaid with each other; the two latter frequently intermixed with irregular masses of epidote; in one instance a narrow belt of conglomerate interlaid with the amygdaloid trap, as the detailed description of the sections will show.

The greenstone and trap rocks, conforming with the bluffs which they form, N. E. and S. W.; and the veins occurring in both

rocks, extend some of them for a considerable distance, in a course parallel to the range of the rocks, through which they run. The long regular bluff No. I., extending N. E. through sect's. 11, 2, 1 and 36, is composed of hard crystalline greenstone; along the entire length of this bluff a vein crops out in its south slope, which has been opened in several places in the different sections, and shows throughout the whole length the same character. (Bluff and vein extends also into sect. 10, the Eagle location, where the same vein has been opened in a different place.) I shall give the description of the veins further below, by describing their appearance in the different openings in each section.

The bluff No. II. is formed by compact gray trap and amygdaloid; on the south slope of it a vein has been traced for some distance, which runs parallel with the bluffs and has been opened in two places.

The bluff No. III. is composed of grey compact trap, but no vein as yet has been found on it.

The bluff No. IV. is a greenstone bluff, and a vein has been found on its north side.

Bluff No. V. in sect. 2, is formed of compact and amygdaloid trap; a vein, running parallel with it, has been opened along the steep north descent of the bluff.

The wide irregular bluff No. VI. is composed of two thick layers of compact and amygdaloid trap, enclosing a narrow ridge of greenstone; both the trap and greenstone range run N. E. The spur of this bluff, running into the N. W. quarter of sect. 6, is composed of compact and amygdaloid trap; on its south slope occurs a narrow belt of conglomerate, very near the foot of the bluff. Several veins have been discovered on these large extensive bluffs, three of which veins occur in trap rock and one in greenstone. One of the three first ones was found on the high precipitous edge of the bluffs E. of the township line, and a little S. of the quarter post, and shows itself from the top of the bluffs to the foot of the perpendicular cliffs, where the gradual descent towards the lake in the S. half of sect. 6 commences. The second vein in the trap is exposed on the south side of the spur of the bluff, extending into the N. W. quarter of sect. 6;—the vein is exposed in several places, but only in one a little to

the N. W. from the centre of this quarter section, has it been opened. On the S. W. descent of these bluffs, near the centre of sec. 1, occurs the third trap vein, and a short distance east of it, N. W. of the quarter-post between sects. 1 and 6, the greenstone vein has been opened. All four veins of these bluffs run parallel with them in a north-easterly course.

The bluff crossing the S. E. corner of sect. 1, is composed of greenstone.

I will now proceed to give a description of these veins, the position of which, and relation they bear to the formations in which they occur, I have tried to illustrate in the foregoing remarks. I was not enabled to examine a single one of these veins to any depth, since all the work that has been done to open them was limited to the surface, and therefore I can merely show you the character of these veins as far as the surface indications will admit. In describing the veins and their appearance in these different openings, I will number the veins with the number of the bluffs on which they occur, and designate each opening with the small letters of the alphabet, in correspondence with the accompanying map. The course of the veins, as ascertained in each opening, and as laid down in the map, will not always be found exactly corresponding with the main course of the vein; but you will observe that the small extent of the openings, as well as the irregularities of the veins on the surface, are sufficient to prevent the ascertaining of the course of the vein with minute correctness; besides which, it seems highly probable that these veins follow to some extent the curves and bends of the bluffs on which they occur.

DESCRIPTION OF THE VEINS.

VEIN NO. I.

Opening a.—Owing to a mistake in regard to the quarter section line, this opening was made outside your lands, on the S. E. quarter of section 36, 13 rods due east from the quarter section line, and 66 rods N. N. E. from the quarter post in the S. line of section 36; but it serves just as well to show the character

of that part of the vein which crosses your land on the corner of S. W. quarter of section 36. This opening along the vein is about 18 feet long—the course of the vein here is 25° E. of N., the dip 75° N. W. The main body of the vein is 1 foot wide, has a distinct head and foot-wall, formed of greenstone, and consists of a seam of white quartz 4 inches wide, and several thinner ones, interlaid with thin seams of chloritic greenstone, several small feeders of white quartz traverse the greenstone forming the head-wall. Both the chloritic greenstone and the quartz carry a great many particles of green carbonate and native copper, but more particularly the quartz. The head and foot-wall are both lined with thin seams of dark colored, fibrous amphibole, and several small feeders of the same mineral can be noticed in the foot-wall of the vein.

Opening b—is situate in the S. E. quarter of section 2, about 105 rods N. N. E. from quarter post of S. line of section 2, and about 40 rods E. of the quarter section line. This opening is only about 10 feet long, and on the south side of a ravine, which intersects the bluffs in a N. W. and S. E. course. The course of the vein is here 45° E. of N., dip 75° N. W. The vein is very well defined; the greenstone, head and foot-walls are smooth, and no branches of quartz visible in either; both walls show several bends and curves, owing to which the width of the vein varies from 1 to 2 feet. The head-wall is lined with a seam of laumonite from 1 to 2 inches thick, and the foot-wall with a thin seam of the beforementioned amphibole. The veinstone is composed of epidote, quartz, chloritic greenstone, and small crystals of laumonite, and carries particles of native copper through its entire width. The appearance of the vein in this opening is very promising. Nine rods S. W. of this opening lies

Opening c.—The vein has been opened here for a length of about 20 feet; occurs in compact greenstone, and is split up in several feeders. The main body of the vein, with a distinct head and foot-wall, is about a foot wide, showing seams of quartz from 2 to 3 inches thick, interlaid with compact and chloritic greenstone—both the quartz and the greenstone carrying small particles of native copper, and covered here and there with thin coatings of green carbonate. The vein runs here for a distance

of about 6 feet due N. and S. and dips 45° W. The foot-wall is somewhat bent and curving, and like the head-wall lined with seams of the fibrous amphibole, which here also occurs in thin seams through the entire width of the vein. Whenever a seam of quartz lays alongside one of these seams of amphibole, the surface of the quartz is smooth, or shows the impression of the bunches of fibres of the amphibole. Several branches, from 1 to 4 inches wide, and filled either with quartz or amphibole, and running more or less parallel with the main body of the vein, can be noticed in the greenstone forming the head-wall; several of these branches in different places, bent and twisted together, carry small particles of native copper. A few feet north of this part of the vein, just now described, and within the same opening, these branches traversing the greenstone above the head-wall, unite with the main body of the vein, increasing its width to about 3 feet, and whilst the character of the vein remains the same, it changes its course to 30° E. of N., and its dip to W. N. W.

Opening d—is situate 86 rods S. W. of the preceding one on the S. W. quarter of section 2, and about 6 rods due west of the quarter section line. The vein is opened here on the north side of a break in the bluffs on a low but steep and rocky descent, for a distance of about 20 feet. For a length of about 10 feet the vein appears to be split up in several small branches, which are intersected by several cross courses, formed of seams of hard flinty horn quartz, of a pale green color; these seams are from one to several inches in width, run N. W. and S. E., and disarranging the main course of the vein in several places, which main course is here 40° E. of N., dipping 45° N. W. In its main features, the character of the vein here is the same as in opening c, except only the changes, the greenstone, which, interlaid with seams of white quartz, forms the main body of the vein, has undergone. By a mixture or fusion with siliceous a portion of this greenstone has become hard and flinty, and almost lost its crystalline structure; in several places this hard flinty rock contains distinct crystals of hornblende, disseminated in the almost homogeneous mass of the greenstone, changing it into a true porphyry; another portion of greenstone, occurring in this part of the vein, forms an amygdaloid, the vesicles of which are filled with white

quartz. The amygdaloid, as well as the porphyritic greenstone, carry particles and thin scales of native copper, like the seams of white quartz, with which they are interlaid.

Opening e—is 26 rods S. W. from last one, and lies right in the S. line of section 2, and in the S. W. quarter of the same section, $24\frac{1}{2}$ rods west of the quarter post. The vein is split up in several branches of different width—one branch, 6 inches wide, apparently represents the main body of the vein, until, about 15 feet N. E., all these branches re-unite to form a vein of about 1 to 5 feet wide. Here the vein has a distinct head and foot-wall, both lined with seams of fibrous amphibole, 1 inch thick. The vein is filled with thick seams of white quartz, interlayered with chloritic greenstone, both carrying a great many particles of green carbonate and native copper. The course of the vein is here 40° E. of N., dip 45° N. W.

Opening f—lays in the N. W. quarter of section 11, 23 rods S. W. from the last opening, on a gradual slope to the S. E., not far from the top of the bluffs. The vein is exposed here for about 5 feet in length, and shows itself 1 to 5 feet wide. Head and foot wall are well defined; the former one lined with a thin seam of decomposed amphibole, of an iron rust color. A branch of white quartz, 4" thick, runs off from the foot-wall, and after having continued in a S. W. course for some distance, it turns towards the vein again, when, gradually decreasing in width, it loses itself with a fissure in the rock. The vein is filled with seams of white quartz, and chloritic greenstone, both quite rich, in particles of green carbonate and native copper. The course of the vein is 60° E. of N., dip 30° N. W. In the next—

Opening g—the last one of this vein on your lands 40 rods S. W. of opening *f*, and situated in the same quarter of section 11—the vein shows itself to a greater advantage, and looks more promising than in any of the preceding openings. This opening *g* lies in the bottom of a deep depression in the bluffs, and extends for a length of 15 feet, and several blasts having been put in, the flattering character of the vein became still more visible. The vein is here 2 feet wide, and shows a well-defined, regular foot-wall, lined with a thin seam of fibrous amphibole; the head-wall does show plainly only in spots; in others a part of the vein. A

seam of white quartz, about 2 inches thick, is fused with the adjoining greenstone, which, within about one foot of the vein, is intermixed with chlorite, but beyond that distance changes into hard compact greenstone. In some parts of the vein the white quartz is interlaid with thin seams of chloritic greenstone; in others the quartz forms large pockets of crystallized quartz, containing bunches of radiating crystals. The quartz is either perfectly white, or of a light green color, the latter undoubtedly originating from a slight mixture of silicate of copper; some portions of the quartz are thickly coated with the green carbonate, whilst the whole of it, as well as the intervening seams of greenstone, (but more particularly the quartz) are rich enough in particles of native copper, to form good stamp-work. Near the south end of this opening, the vein decreases to the width of 1.5 feet, and a seam of pale green flinty horn quartz, about 5 inches thick, and several particles of epidote and chlorite make their appearance in the vein. In this opening, the vein bears 30° E. of N. dip W. by N. W. 64° .

The next opening on vein No. 1 to the S. W. is on Eagle location, section 10. The remarkable regularity which the character of this vein exhibits for the long extent of two miles, its regular course and dip, and general healthy appearance, are sufficient reasons to consider this a vein of great value, which undoubtedly will yet be enhanced, if, as it is very probable, it will be found to cut across the green-stone into the trap-rock.

VEIN NO. II.

Opening a—is located in the N. E. quarter of Section 11, 70 rods S. S. E. of the quarter-post in the N. line of Section 11, and nearly 9 rods due east of quarter-section line. The vein is here exposed for a length of about 8 feet, on a steep south descent of the bluffs, about 16 feet below the top. The vein is about 6 feet wide, with a distinct footwall, which is formed of fine grained trap-rock, intersected by irregular branches and masses of hard epidote. The head-wall is not very distinct, owing to a mass of epidote, which lays in the vein and is fused with the hard compact gray trap, forming the top-rock. The vein itself is filled by red amygdaloid trap, the vesicles of which

are filled with ehlorite, laumonite, limespar and quartz. This amygdaloid trap is traversed in all directions by numberless feeders of white quartz, epidote and laumonite, varying from a thin seam to branches of several inches in thickness, and sometimes widening out in large pockets. The branches and pockets of white quartz carry a great many particles of native copper, and in many places the quartz is covered by thick coatings of carbonate of copper; some portions of the quartz are colored by ehlorite. The seam of epidote, running along and fused with the top-rock, is about 6 inches wide, and interspersed with amygdals of white quartz. The course of the vein in this opening is 50° E. of N.; dip, a little N. W.; the vein is almost perpendicular.

Opening b—lies $36\frac{1}{2}$ rods S. W. of the preceding one, in the N. W. quarter of section 11; it exposes the vein for a length of about 15 feet. The bearing of the vein here is 50° E. of N., dipping 45° N. W. For a distance of about 7 feet the vein appears very regular and well defined, $1\frac{1}{2}$ foot wide, with a distinct head and foot-wall; the headwall is composed of gray compact trap, as also the footwall—the latter interlaid with irregular masses of epidote; the footwall is lined with a seam of laumonite, about 1 in. thick. The vein itself is composed of several seams of white quartz, from 4 to 6 inches wide, interlaid with thin seams of red amygdaloid trap of the same description, which fills the vein at opening *a*. Nearly the whole of the quartz is thickly coated with green carbonate, and contains numerous little lumps and scales of native copper. East of this part of the vein, in the same opening *b*, the seams of quartz disappear, and the vein is filled entirely with the red amygdaloid trap, the vesicles of which are sometimes very large, and filled with white quartz; the foot-wall is but partially distinct, but no head-wall can be seen, the amygdaloid trap of the vein being fused with the hard gray trap, forming the top-rock.

You will observe by the description I have just given of the two openings of vein No. II, limited as they are, that the prospects this vein offers, are very fair and encouraging, and I have not the least doubt but that, by penetrating to a greater depth, you will find it a rich vein.

VEIN NO. IV.

Little can be said at present about this vein, as it has not been opened, and my time did not allow me to stay until this was done. This vein is but very little exposed on the north slope of the greenstone bluff, No. IV., crossing the S. E. quarter of section 11. in a N. E. course. The vein occurs very near the centre of the quarter section on the steep rocky south side of a ravine, through the bottom of which runs a small creek towards N. ; the vein is split up in a number of quartz branches, carrying particles of native copper, and running more or less parallel with each other, bearing E. of N. The space between the different branches is filled with hard compact greenstone.

VEIN NO. V.

This vein has been opened in several places along the bluffs, in all of which it shows exactly the same character. I therefore will give you only a description of the most extensive one, which lays 27 rods S. W. of the quarter-post of the south line of section 2, and 16½ rods due S. of the quarter section line, and extends from the top to the foot of the bluffs, with a width of about 8 feet. The bluffs, on which this vein occurs, are composed of red compact and amygdaloid trap, both apparently intermixed with small crystals of laumonite, and the vesicles of the amygdaloid are filled with quartz and chlorite. The vein lies alongside the steep north descent of the bluffs, forming, as it were, the surface of it, which infers at once, that down to the foot of the bluffs, the head-wall and top-rock is wanting, in which latter place though it is distinctly visible. The vein bears 40° E. of N., and dips about 65° N. W. The foot-wall is regular and well defined, and consists, like the head-wall on the foot of the bluffs of the before described amygdaloid trap, the amygdals of which near the vein are in some places very large, and consist of quartz, limespar, laumonite and chlorite, and occasionally containing particles of native copper. The vein is about 8 inches wide, composed of hard amygdaloid epidote rock, the vesicles of which are filled with white quartz. Large pockets of crystallized quartz and limespar, sometimes several yards long, and very rich

in particles of native copper, occur in this epidote; a small seam of quartz, with the same bearing as the vein, but dipping S., and carrying particles of native copper is exposed on the tops of the bluffs.

VEINS NO. VI.

Four veins having been opened on this bluff, but each in one place only, it will be best to designate these different veins in this report, and on the map, with the small letters of the alphabet, commencing with

Vein a—It is opened about 40 rods W. S. W. of the quarter-post of the east line of sect. 1, on the steep south descent of bluff No. VI., about half way between its foot and top. The vein is 2 feet wide, has a distinct foot-wall, lined with a seam of laumonite, from 1 to 2 inches thick. The vein is opened for about 15 feet, and is composed of epidote, white quartz, chlorite, and hard compact trap-rock, which also forms the foot-wall. No distinct head-wall can be seen. I could not discover the slightest indication of copper in this vein, the bearing of which is E. N. E., dipping 45° N. W.

Vein b—has been opened for 10 feet in a place 7 rods almost due west from the before-mentioned quarter-post of sect. 1. The vein occurs in the narrow ridge of greenstone spoken of in the description of bluff No. VI., and on the south side of it, where the opening lies very near the top. The vein is one and a-half feet wide, runs E. N. E., and dips 45° N. W.; it is formed of white quartz, from 4 to 6 inches thick, interlaid with hard compact greenstone, but does not show any indication of copper; both head and foot-wall formed of greenstone, are plain and regular. The thin seams of greenstone, interlaid with the quartz of the vein, carry small particles of iron pyrites, for which reason the miners who opened it, mistaking the mineral, called it the "gold vein."

Vein c—This vein was exposed, and has been opened for some distance along the face of a steep precipice on the east descent of bluffs No. VI., a little south of the quarter-post in the township line, between sects. 1 and 6, and a short distance east of the same, in the N. W. corner of the S. W. quarter of sect. 6. The

bearing of the vein is 50° E. of N. dip N. W.; it is about five feet wide, and composed of amygdaloid trap and epidote, showing here and there a few particles of green carbonate and native copper. A regular head and foot-wall cannot be traced for any great distance, though the vein shows a regular course as far as it is exposed to view along the cliffs. The rock adjoining the vein on both sides, is hard gray trap. This vein deserves a minute and careful examination in a greater depth.

Vein d—is located on the spur of bluff No. VI., running diagonally through the N. W. quarter of sect. 6. The place, where it has been opened is 123 rods N. E. from the quarter-post, between sects. 6 and 1, on the sloping S. side, and near the top of the low bluff. The headwall of the vein is quite distinct, regular, and formed of compact gray trap; the entire absence of a foot-wall makes it difficult to ascertain the width of the vein with any degree of certainty; though this width seems to be not less than six feet. This vein is of a very interesting character, and composed as follows:

Next to the head-wall extends a layer of hard, porous gray trap, very much resembling lava; it is two feet thick, and exhibiting a great deal of regularity in width. Adjoining this is a layer of common amygdaloid trap, varying in width from one to two feet, and this again is underlaid by a thick mass of hard, light green epidote rock, of amygdaloid structure, and very irregular width, fused with, and gradually changing into the gray, solid trap, forming the foot-rock. The porous trap is much intermixed with chlorite, which gives it a somewhat greenish color; its cavities are of very irregular shape, and some are filled with quartz, lime-spar, or chlorite, occasionally pieces of green, flinty, hornquartz occur in it. Large pockets of white quartz are deposited in this porous trap, quite rich in small lumps of native copper, and the green carbonate. The amygdaloid trap of the vein does not show any copper, and its vesicles are filled with epidote, quartz and chlorite. The epidote rock shows, as before mentioned, amygdaloid structure, containing amygdals of quartz, pure epidote of dark olive-green color, and serpentine or chlorite, but does not carry any copper. The amygdaloid trap, perhaps, forms merely the foot-rock of the vein, but the want of anything like

a foot-wall prevents from ascertaining this fact. The course of this vein is 45° E. of N., dip 65° N. W.

The great extent of your lands, and the short space of time allotted to me for its exploration, prevented me from examining all parts of it with equal minuteness; but that portion of it which has been subjected to the detailed description in this report, already shows your location to be one of great value, though there is no doubt, but that by continued explorations more valuable veins yet will be found on it. All which is respectfully submitted.

A. RUDOLPH.

Report of A. Rudolph, Geologist and Mineralogist, on the Ontonogan Tracts of the "Great Western Company's" Lands.

EAGLE RIVER, (Lake Superior,) September 23rd, 1851.

To T. P. HARRINGTON, Esq.

DEAR SIR,—Agreeably to your request I repaired to the "Great Western Location," and after a careful geological exploration of the same, submit to you the following:

The tract of land, known as the "Great Western Location," comprises 2 quarter-sections, the south-west quarter of section 29, township 51 N., range xxxvii. W., and the south-east quarter of section 30, of the same range and township. It is situated 15 miles south-east of the mouth of the Ontonogan river, and 13 miles S. S. E. from the mouth of Firesteel river, and is bounded on the west by the Algomah, on the south by the Piscataqua, and on the east by the Pioneer Location.

Several small creeks traverse this tract of land, though none of them sufficiently large to offer water-power; the largest of these creeks, a branch of Firesteel river, flows very near through the centre of the west half of the south-west quarter of section 29, and contains water enough for the stamping and washing process.

Two bluffs, of considerable height, run through a part of the

Great Western location; the largest rises abruptly on the Pis-cataqua location, from the surrounding valley, but a short distance south of the south-line of the Great Western tract, and runs in an E. N. E. course through the west-half of the Great Western location, and extends but a short distance into the east-half of it, where it descends precipitously towards the before-mentioned branch of Firesteel river. The highest point of this range of bluffs, as ascertained by Mr. Whitney, is near the S. E. corner of section 30, and is elevated 633 feet over the level of the lake. This range of bluffs has, with the exception of a few knobs, a pretty regular height, its sides are steep, and in a great many places precipitous, forming almost perpendicular walls of rock. The second bluff seems to be merely a continuation of the first-mentioned, and is only separated from it by a deep ravine, in the bottom of which runs the branch of Firesteel river—it runs in the same course, and its highest point is near the N. E. corner of the location, from which point two spurs extend towards N. and S., the north spur descending gradually towards the N. line, the south spur crossing the E. line of the location. The land to the N. W. of these bluffs rises gradually, almost imperceptibly from the foot of the bluffs towards the N. and W. line of the tract, forming the gradual ascent of the range of bluffs, on which the Algoma and Aztec mines are located; the land south of the bluffs is almost level; and, like the land to the N., intersected by deep ravines, and covered with a deep soil, underlaid with a thick stratum of diluvial sand, which, though forming excellent agricultural land, well sheltered by the surrounding mountains, prevents a thorough and successful exploration for veins. The growth of timber on this location is chiefly maple, oak and birch, but very little pine and hemlock.

The whole extent of the 2 quarter-sections, forming the Great Western location, lies within the Trap range; the 2 high bluffs, crossing it an E. N. E. course, are formed of this trap, and a number of fine promising veins has been discovered on them. I will now proceed to enumerate these veins, giving at the same time a description of them, as far as their being opened allows. (For greater convenience sake I shall number these veins, which same number will designate their position on the map:)

South-east Quarter of Section 30.

Vein No. I.—On the south side of the bluffs, a few rods from the south corner-post of sections 29 and 30, right in the north and south line, between the 2 sections, at the mouth of a deep depression in the bluffs, a vein is visible, which, though it has been opened but little, and shows as yet no regularity, promises to become a valuable vein. (Present experience of mining in the Ontonogan district has shown no regularity of the veins on the surface, though, when struck in a greater depth, they became regular and well defined.) Although the main course of this vein seems to be E. of N. and W. of S., it is impossible to ascertain the same at present with any degree of certainty, since a portion of the vein is split up in a large number of small branches, running in different courses, and no regular walls can be traced for a sufficient distance, to show the course of the main body of the vein correctly. The rock, in which this vein occurs, is an amygdaloid trap, which appears porous on the surface, apparently from a decomposition, and afterwards washing out of ehlorite, with which the amygdals were originally filled, as the fresh-broken rock shows. A few feet east of the vein occurs a large mass of hard compact epidote, about 3 feet wide, showing for a short distance a regular foot-wall, and running by all appearance parallel with the vein; but very soon this body of epidote splits up in a great many small branches, running in different directions through the rock. The amygdaloid rock, which forms the short extent of regular foot-wall of the vein, has its amygdals filled with epidote and limespar; it dips a little W. by N., and is intersected by numerous pockets and threads of white quartz and epidote. In the upper part of the low bluff, on which the vein is opposed, it shows nothing but a fissure in the amygdaloid trap, on both sides of the same traversed by feeders of white quartz and limespar; but about half way down from the top to the foot of the bluffs, the rock next to the fissure, which apparently forms the foot-wall of the vein, becomes less compact, and is composed of trap, epidote intermixed with lumps of native copper, from the size of a thumb downward,

thickly coated with green carbonate and protoxide of copper. By digging down about 1 foot on the vein, I found its width, and the quantity of copper it contained, increase considerably; the width was about 2-5 feet, carrying pieces of native copper of the above description through its whole breadth, though no head-wall was to be seen. After having several blasts put in, the foot-wall disappeared also, but the vein apparently became still wider, and large quantities of limespar and ferruginous quartz, besides small portions of red oxide of copper became intermixed with the rock, which still carried a large number of lumps of native copper. My time being very limited, I could not stay to have this vein examined any further, much as I should have liked to do so; the richness of the vein, besides the success of the neighboring Piscataqua mine, working a vein in the same bluffs, similar, but less promising on the surface than the vein in question, which, after having drifted on it for some distance, offers a very good show now, besides the circumstance, that the vein has only been opened in high unsettled ground, warrants the expectation, that it will turn out a valuable vein, when traced to a greater depth in a more settled rock.

Vein No. II.—On the north-side of the bluffs, and on the foot of them, about a quarter of a mile west of the N. and S. line, between sections 29 and 30, is another vein exposed, running a little S. of E. and N. of W., perpendicular; one of its walls is fairly developed, whilst the other cannot be traced. The vein is about 7 feet wide, composed of amygdaloid trap, epidote, and pockets of white quartz. Through the whole mass of the vein, and particularly in the centre of it, the green carbonate of copper can be noticed in every direction, though there is no native copper visible. This vein seems to be merely a branch of

Vein No. III.—One rod east of the preceding one. This is a very well defined vein, 6 feet wide, running S. S. E. and N. N. W., and dips perpendicular. The east wall is the most regular, and lined with a seam of laumonite, 2-3 inches wide, several thin veins more of the same mineral, running parallel with the seam, occupy about one-third of the whole width of the vein. The rest of the width of the vein is filled with epidote, partly hard and flinty, partly forming a soft green earth, owing to an intermixture

of a large amount of green carbonate of copper. The hard epidote rock is of amygdaloid structure, the amygdals filled with quartz and native copper, or sometimes with native copper alone; here and there larger pockets of crystallized quartz occur in the epidote. As far as this vein has been opened, (about 4 feet) it seems to be the most regular on the location; the regularity with which the copper is diffused through the epidote, though not very rich yet, besides the vein being traced right on the foot of the bluffs and running into the same, allowing a deep adit level to be driven along its course, are advantages which recommend this vein to your particular attention. About 10 rods east of this vein is

Vein No. IV.—A thin seam about three inches wide, and composed of laumonite, limespar and quartz, runs alongside the east wall of this perpendicular vein, the bearing of which is E. S. E., and W. N. W.; 3 feet west of this seam is another distinct wall, and the space between both is filled with amygdaloid trap, which also forms the adjacent rock. The trap, occupying the space between the two walls, contains masses of red ferruginous quartz and large pockets of calcareous spar, which carry particles of native copper as well as the vesicles of the amygdaloid trap-rock. Very little epidote occurs in this vein, and in its whole appearance it resembles very much the veins on Keewenaw point. Still further east, on this side of the bluffs, and only a short distance west of N. and S. line, between sections 29 and 30, is

Vein No. V.—This vein has been opened on the side of a steep precipice for a distance of several feet. It runs somewhat S. of E., dips a little to the north, and occurs in hard compact trap. A seam of quartz, about two inches wide, runs alongside a thick irregular mass of epidote, fused with the adjoining trap rock and traversed by a number of thin branches of quartz, carrying, like the quartz, seam particles of green carbonate and native copper, which latter, in many places, by the exposure to the atmosphere, has been changed into protoxide. This vein, when traced to the foot of the bluffs into more settled rock, may prove a very promising one.

Several epidote veins of minor importance were found in dif-

ferent parts of the bluffs, and undoubtedly other valuable veins will yet be discovered on it in the course of time. As far as the correctness of the bearing of the before-mentioned veins, as given in this report, is concerned, it is but proper to remark here, that their being opened for but a very short distance did not allow to ascertain their course with minute correctness.

South-west Quarter of Section 29.

In the south-west corner of this quarter-section, not far from the corner-post, on the south side of the bluffs, is a range of ancient diggings, extending along and about halfway up the side of the bluffs, lying in a N. N. E. course. (Another of these ancient excavations lies nearly in the same course west, and but a short distance from the N. and S. line, but showing no indication of a vein. I did not mention it in my description of the other quarter-section.)

The westernmost of these ancient excavations is about 8 feet deep, and about 2 feet wide at the bottom; it shows a regular, well-defined vein of epidote and white quartz, 8 inches wide, carrying particles of green carbonate and native copper. The bearing of this vein is E. N. E. by W. S. W.; it dips about 75° north, and the walls are formed of amygdaloid trap. The next excavation is but a few feet distant from the first one, has the same depth, but is considerably longer; it opens the same vein for a length of about 10 feet. The vein is of the same width, course, and dip, as in the first excavation, but the vein-stone, by being mixed with a large quantity of green carbonate of copper, becomes quite soft, and contains large chunks of native copper, covered with a thick coat of red oxide. One thick sheet, apparently filling the whole width of the vein, we could not remove. The amygdaloid trap, forming the regular head and foot-wall, contains masses of epidote in both excavations. Two more excavations have been sunk on the course of this vein, but to the depth of 3 feet only, and show merely a thin seam of epidote and quartz. This vein undoubtedly will prove regular and very rich, when examined in a greater depth.

Several epidote veins, occurring on the bluffs east of Firesteel river branch, will prove of importance, when sufficiently opened.

All of which is respectfully submitted, by

A. RUDOLPH

*Report of A. Rudolph concerning various Mining Locations
on Keewenaw Point, Lake Superior.*

[FROM A. RUDOLPH.]

EAGLE RIVER, October 21, 1852.

F. P. HARRINGTON :

Dear Sir,—

In compliance with your request to examine certain mines on Point Keewenaw, and report to you about the probable mineral value of the same, I visited [these different locations, and after a careful examination of the veins found thereon, submit to you the following :

All the different locations, the mineral veins of which I am going to describe, occupy the same position in reference to the geological situation of Keewenaw Point ; that is to say, they lie all, without exception, in the second trap range, south of the high greenstone bluffs, which traverse the entire length of that peninsula, in a course varying from E. and W. to N.E. and S.W., and right along the foot of these bluffs the largest portion of the ground of these different locations extends into the trap range, while but a small space of it in each of them is covered by greenstone, embracing the summit of the bluffs. These bluffs, formed of greenstone, are underlaid by a stratum of conglomerate, near the eastern extremity of the point, about 6 or 7 yards thick, and dipping north, in conformity with the greenstone ; its thickness (the conglomerate) decreases in going west ; at the Eureka Mines its thickness amounts only to a few inches, and it disappears at the Cliff Mine entirely. The trap rock, underlying the conglomerate, and forming the so called second trap range of

Keewenaw Point, is formed of alternate parallel belts of amygdaloid and solid compact trap, and it is in this range that veins, traced from the face of the greenstone bluffs (where they are but poor in mineral) into it, have been so wonderfully rich, as the Cliff Mine, &c. Nearly all these veins traverse the bluffs almost at a right angle, running more or less north and south, and retaining this course in the trap rock also. Owing to the intervening belt of conglomerate, between the greenstone and the trap south of it, and a large amount of loose rock on the foot of the bluffs, the tracing of these veins from the greenstone into the trap, is connected with many difficulties, the more so since the veins are more or less split up near the junction of the two formations, and sometimes, even for some distance, thrown out of their course.

After having given this general outline of the geological structure of that part of the mineral region in which the different tracts of land you wished me to examine are situated, I will proceed now with the description of the different locations.

I. This tract of land comprises the south half of section 10, town 58 N., range 28 W. Two fine veins have been opened on the bluffs, but only the most promising one has been traced and opened in several places in the trap rock. This vein is from 3 to 4 feet wide near the top of the cliffs, shows distinct walls and carries fine particles of native copper, and occasionally of silver in a matrix composed of phrenite, limespar, quartz and chlorite, resembling in every respect the cliff vein in the greenstone. The same vein was opened on the foot of the bluffs in several places; in that nearest to the bluffs—

1. It was struck by a surface crosscut. It is here $1\frac{1}{2}$ ' wide, shows two well developed walls of gray solid trap, and is filled with a red amygdaloid trap, (the color caused by a large mixture of laumonite,) containing amygdals, sometimes widening into large pockets of phrenite and limespar, carrying particles of native and green carbonate of copper. The west wall is lined with laumonite about 1" thick. In the course of the here perpendicular vein, a little E. of N., the vein was struck again some distance south of this.

2. By another crosscut; and is here two feet wide; has smooth, well-defined walls, which are lined with laumontite. The vein is here filled with dark green trap, (composed of hornblende and chlorite,) and containing small vesicles filled with chlorite. The entire mass of this trap has disseminated through it a large quantity of minute particles of native copper. Remarkable is the globular structure of this trap rock, each globe composed of concentric shells, which in breaking become separated. Still south of this is a

3d Crosscut, which shows the same appearance of the vein as in crosscut two—the grain of the dark trap only appears a little coarser.

A short distance W. of the vein opened in crosscut one, in the same crosscut, a vein of laumontite, one foot wide, was opened running E.N.E. and W.S.W., and carrying particles of native and green carbonate of copper. This is in all probability merely a branch of the former vein.

The appearance of this vein down the entire face of the bluffs is as promising as that of almost any vein in the greenstone on the point, and I have no doubt this vein will prove very valuable when opened to a greater depth in the trap—all present openings in that formation on this vein being merely a removal of the soil from the rock.

II. The N. W. quarter of section 9, of town and range as before, and shows, near the S.W. corner one of the finest and most promising views one can see, though it is opened only on the surface in the trap. This vein runs a little E. of N., is three feet wide, has two well-defined, smooth walls, lined with laumontite, and shows a "combed" structure, forming layers parallel with the course of the vein; along the E. wall lies a layer, 6" thick, of limespar, quartz, and phrenite, very rich in native copper; along the W. wall extends a layer of ferruginous quartz one foot wide, and the intervening space is filled with red amygdaloid trap, traversed by pockets and feeders of white and ferruginous quartz, carrying many particles of native copper. This vein has been opened in two places, not far apart, but only on the surface, and shows in both exactly the same character.

In the W. half of section 8, town and range as before.

III. The most remarkable feature of this tract of land is the great height of the bluffs from the valley at its foot; not that the elevation above the level of the lake of the greenstone is any greater here than at the preceding places, but the trap rock, instead of descending, as in the beforementioned localities, gradually to the valley of Little Montreal River, from the foot of the greenstone bluffs, descends at a steep angle at once into the valley, forming, as it were, a continuation of the greenstone bluffs, giving a steep ascent, from the creek to the summit of the bluffs, of from four to five hundred feet, a circumstance of great consequence to the future mining operations on this location, since it allows to drain a vein, opened and worked upon in the trap rock to the depth of four hundred feet, by a short adit level, driven from the foot of the entire bluff. A vein of very promising character has been traced from the top of the bluffs to within twenty feet from their base; it has been opened in two different places in the trap.

The 1st opening, about three hundred and thirty feet above the valley, is only on the surface, and shows the vein divided into two branches, diverging from the bottom of the opening. The west branch is 15 in. wide, has two distinct walls of gray compact trap, and is composed, in parallel layers, of 6" laumontite and 9" quartz, phrenite and limespar, containing particles of native copper, which increase to lumps of half lb. weight. The east branch dips east, is about three feet wide, and composed of one foot laumontite, four inches quartz and chlorite, and the rest of amygdaloid trap, the vesicles of which are filled with chlorite. This branch carries native copper through its whole width, particularly that portion which is composed of laumontite and quartz.

The 2d opening, on this vein, is about eighty feet above the bottom, on Montreal River, and consists of a level forty-three feet long. This level stands twenty-nine feet in sand and boulders, the rest of fourteen feet in the rock. At the present end of it, the vein is eighteen inches wide, and composed of two seams of white quartz, each about three inches wide, along the two distinct walls, and the space between them filled with amygdaloid trap, every portion of the vein carrying small particles of copper.

These three mentioned locations can be connected by a good, and very gradually ascending and descending road, with Copper Harbor, the best harbor on the lake, from which they are distant in a direct line only about two miles.

IV. The S. W. quarter of section 12, township 58, N., Range 29, W.

There is only one vein on this tract that has been opened in the trap; but unfortunately the shaft by which this was done was completely filled with water, and I could merely examine the specimens of rock taken from this shaft, which consisted of laumontite, quartz and chlorite, limspar and phrenite, all carrying particles of native and green carbonate of copper. Mr. Dolan represents this vein as 18" wide, with a distinct west wall, dips a little west, and of a decided combed structure.

V. N.E. quarter of section 17, of township and range as before. Two shafts have been sunk on this location, a little E. of the centre of it, on a vein in the trap 195 feet apart. The north shaft is $87\frac{1}{2}$ and the south shaft $56\frac{1}{2}$ feet deep; it was contemplated to connect both shafts by a gallery driven on the course of the vein; that portion driven from the north shaft south, attained a length of one hundred and nine feet, and that driven from the south shaft north, of twenty-five and a half feet. At the end of the gallery driven from the north shaft, the vein is one foot wide, perpendicular, well-defined, with walls of compact gray trap, lined with serpentine, and running 20° W. of N. The vein is composed of laumontite, limspar, quartz, chlorite and dark-colored trap, containing particles of serpentine and chlorite, and all impregnated with particles of native and green carbonate of copper, forming a tolerable good stampwork. In the drift driven from the south shaft, the width of the vein decreased to three inches, and is composed of seams of laumontite, interlaid with dark trap, carrying copper. The continuation of these works was suspended, and has been so for some time. About three hundred feet S. of the south shaft, an edit level has been driven some time ago on the course of this vein 100 feet.

Numerous surface crosscuts have been made in different parts of the location, to strike sundry promising veins that had been

opened in the greenstone, in the trap rock, but owing to a thick deposit of diluvial dry sand, from ten to thirty feet thick, that covers the largest portion of the trap on this tract of land, this was a laborious and expensive work, and has as yet not been properly developed. Among the several veins that have been opened in the greenstone, the most prominent is two feet wide, perpendicular, with perfect walls, and composed like most of these veins in the greenstone, of seams of quartz and greenstone, but in such a state of decomposition, that it is difficult to recognize the small particles of copper in it.

The most promising deposit of copper on this location was accidentally discovered in digging away the soil on a low bank, a short distance N. E. from the north shaft, for the purpose of laying the foundation of a stable. A barrel of pretty large lumps of native copper was obtained in digging down a few feet in the rock, which is thoroughly impregnated with green carbonate of copper, and composed of a red amygdaloid trap, the large vesicles of which are filled with limespar, quartz and phrenite, sometimes widening into large pockets. This deposit does not show any regularity on the surface—it extends apparently east and west; has no indication of a wall, and is in all probability a feeder of a rich vein, deserving a very careful examination.

All which is respectfully submitted by

A. RUDOLPH.

WASHINGTON, D. C., *July 1, 1852.*

F. P. HERRINGTON :

Dear Sir—I have received your letter asking my opinion of the skill of Albert Rudolph as a geologist.

My acquaintance with Mr. Rudolph commenced in the summer of 1844, when he was sent to Lake Superior by the Pittsburgh and Boston Mining Company. He has been more or less employed by that company as a geologist and mineralogist from that time till the present, and in both of these departments we have found him to possess skill and judgment of a very superior

order. I know of no one on whose geological knowledge, as connected with minerals, I should be inclined to rely with more confidence.

Yours, very respectfully,
THOS. M. HOWE,

*Treasurer of Pittsburgh and Boston Mining Company,
and Member of Congress.*

This is to certify, that the undersigned have been acquainted with A. Rudolph, Esq., for the last six years. He was employed by the Pittsburgh and Boston Mining Company as a professional geologist to explore their copper lands on Lake Superior, and he has also been employed by other companies who wished to obtain correct information in regard to the geological character of their mineral lands.

We take pleasure in saying, we have the utmost confidence in his honesty and scientific knowledge, and believe his reports may be fully relied upon.

CHARLES AVERY,
Presid't P. & Boston Mining Company.

C. G. HUSSEY,
Director P. & Boston Mining Company.

JAMES M. COOPER,
Treas. and Sec. of North-West Mining Com'y,
and Treas. and Sec. of Adventure Min'g Com.

PITTSBURGH, June 28th, 1852.

CLIFF, OR PITTSBURGH AND BOSTON MINING COMPANY.

In order to illustrate the importance and probable relative value of the property of the "Great Western Mining Company," it may be proper to state some information relative to the annual expenses and production of the "Cliff Mining Company," whose lands are in the vicinity, on *Keweenaw Point*, of the lands num-

bered 3 to 7 of the "Great Western Mining Company," and, most probable, of equal value, and are similar veins. The "Cliff Company Mining Lands" were purchased in the origin of the copper-mining business on Lake Superior, and for the two first years produced no remarkable results to prove them any better than many other mines now abandoned by their original owners, mainly for the want of *money* means to persevere for two years in opening and exploring the mines. Professors J. W. Foster and J. D. Whitney were employed for five or six years in a geological and mineralogical survey and examination of Lake Superior country by the government of the United States, and in their report published by Congress, 1st Session, 31st Congress, House of Rep., Doc't No. 69, p. 127, they report as follows :

"The Cliff mine is situated on Keweenaw Point, about three miles from the lake shore, in the southwest quarter section 36, township 58 north, range 32 west. A range of elevated hills sweeps round in a crescent form, trending in a southwesterly direction, and forming the western boundary of the valley of Eagle river. In places these hills attain an elevation of 800 feet, and towards the valley present bold mural escapements, while on the side exposed to the lake the slope is gradual. This range is composed of trappean rocks. The summit is capped by a hard crystalline greenstone, as at the Cliff mine, passing into a feldspathic porphyry, as at the Albion. Below, and forming the base of the ridge, is a belt of granular trap, occasionally amygdaloidal. Between the two there is a thin belted slaty chlorite about twelve feet in thickness. These belts dip to the north at an angle of 45° , conforming in this respect to the inclination of the dental rocks, which flank the range on the north. Wherever veins are observed in the greenstone, they are found to be pinched and barren; but where they enter the compact or granular trap, they expand in width, and become charged with metal. This trap has a good degree of firmness, and consists of Labrador feldspar and chlorite. It has been remarked that the best rock in this region for productive veins is neither a crystalline greenstone nor a soft porous amygdaloid, but a granular trap, with occasional amygdals scattered through it, and 'pos-

sessing a good degree of consistency. Where veins enter the greenstone, as before remarked, they become pinched; where they penetrate the soft amygdaloid, they become scattered, and lose themselves.

The lode of the Cliff mine is seen to occupy a break or depression in the hill, and thence can be traced to its base. It was discovered in the summer of 1845, and during the succeeding fall a drift was carried into the greenstone about one hundred feet, (see plan A,) and between that point and the summit several others were opened. When first discovered, the vein could only be seen in the upper belt of greenstone, the metalliferous zone being concealed by detritus. No one could have inferred from its appearance at that time that the enormous masses of copper existed but a short distance below, which subsequent explorations revealed. It was examined by Dr. Jackson and Mr. Whitney conjointly, about the time of its discovery, who reported that the surface indications were not highly favorable at the points where the vein was exposed, but that, as it became wider and richer in its downward course, the company should by all means make a thorough examination by uncovering and examining the vein at the base of the cliff. At the summit it appeared hardly more than an inch or two in width: the gangue was mostly phrenite, with copper associated with silver, interusted with beautiful capillary crystals of red oxide. Further down the vein was again exposed; here it had expanded to the width of nearly two feet, the veinstone consisting of a series of reticulations of laumontite.

Up to this period the sandstone and conglomerate were supposed by many to afford the best mining-ground, and that to this source they were to look for permanent supplies of the sulphurets of copper.

During the winter of 1845-'46, some German miners, in clearing away the talus near the base of the cliff, discovered a small loose specimen of mass copper. This stimulated them in their researches, which resulted in the discovery of the vein in the belt of granular trap, (b,) about twelve feet to the east, showing that it had been subjected to that amount of heave or dislo-

cation. From that point a level was carried into the hill seventy feet before anything valuable was developed, when the great mass, so called, was struck—a fortunate circumstance, not only to the company, but to the whole mining interest on Lake Superior. It gave encouragement to those engaged in these pursuits, and induced them to persevere. It also demonstrated the true source from which the loose masses occasionally found on the lake shore had been derived. It demolished the fanciful theory advanced by at least one geologist as to the transport of the Ontonogan mass from Isle Royale, and showed that it was not necessary to resort to icebergs and changes in the relative level of land and water to account satisfactorily for its position. From that time to the present day, hardly a month has elapsed without developing new masses; and their occurrence, so far from creating wonder, is regarded as a matter of course. The largest single mass hitherto exposed, weighed about fifty tons. The position of the mass copper in the vein is indicated by the spaces between the dotted lines marked M, while the intervening spaces, marked S, afford stamp work.

It will be seen, by reference to the plan, that the levels 1, 2 and 3 have been extended northwardly into the greenstone before described, but in no instance has the vein been found after having pierced that rock. This arises probably from the lateral dislocation before referred to, the true position of the vein being twelve feet to the west. As a matter of curiosity even, it would be desirable to cross-cut to determine the extent of this fault, and the character of the vein where it enters the greenstone. It will, without doubt, be found less metalliferous at that point than in the granular trap which contains the present workings.

The deepest shaft in this mine has been sunk 270 feet below the surface. The other two are little less in depth. The adit, which drains the mine to the depth of 100 feet below the first gallery, has been extended 750 feet. The amount of stopeing and timbering, and the disposition of the *attle*, or rubbish, will be seen by inspecting the plan.

The force employed in this mine at the present time consists of 160 men. The mine is under the management of Capt. Jen-

nings, who has displayed much energy and judgment in developing it. If any criticism may be allowed, it would be to the effect that there has been no increase in the force for the last eighteen months. The openings in the mine should be in advance of the stopework. By pushing these forward the country is explored, ample space is given to the miners to work, and opportunities from time to time afforded to increase the force.

The machinery employed for raising the ore and freeing the mine from water is admirably contrived; but the mine is now so thoroughly opened, that the company will soon substitute a steam-engine in the place of horse-power. The stamps erected here were the first which operated successfully, and have served as a model for the mines in other parts of the district.

From the reports of the trustees rendered in 1849 and 1850, we gather the following information:

The amount of capital stock paid in by the stockholders = \$110,000. The personal effects of the company on the 1st of December, 1848, were \$140,982, leaving a surplus of \$111,105 — a sum a little more than equivalent to the entire capital stock. This statement does not include the mine, with its fixtures and improvements, such as the stamping mill, furnace," &c.

An Act to authorize the formation of corporations for mining, smelting or manufacturing iron, copper or silver ores.

Section 1. *The People of the State of Michigan enact,* That any three or more persons who may desire to form a company for the purpose of engaging in any kind of mining, smelting or manufacturing iron, copper or silver ores, may make, sign and acknowledge before some person authorized to take acknowledgments of deeds, and file in the office of the county clerk of the county in which the business of the company shall be transacted, and a duplicate thereof in the office of the Secretary of State, a certificate in writing, or may file such certificate in the first instance, in the office of the Secretary of State, and a duplicate thereof in the office of said county clerk, in which shall be stated the corporate name of said company, and the objects for which the company

[Continuation of Foster and Whitney's Report.]

The net products of the mine, and the expenses of mining proper, from the commencement, are given below to January 1st :

	Products.	Expenses.
1846.....	\$8,870 95.....	\$32,203 44
1847.....	70,977 32.....	61,737 85
1848.....	166,407 02.....	67,667 58
1849.....	244,237 54.....	106,968 77
*1850.....	155,227 34.....	102,708 60
†1851.....	177,044 36.....	116,855 40
†1852.....	174,931 96.....	127,715 19

This embraces such expenses only as were incurred at the mine; those of insurance, commissions, freights, &c., are excluded. The cost of transportation to Boston is \$15 per ton; to Pittsburg, \$7 50. The incidental expenses amount to about 20 per cent., in addition to those of mining.

The company have erected the necessary works at Pittsburg for smelting and refining the copper, and they estimate that the shipments for the year ending December, 1849, will amount to 660 tons of refined copper.

The product of silver for the year 1849 was \$2,365 30.

* To those amounts, the balances *due* from Agents, not included.
 † Those outlays include new Engines and Machinery.

shall be formed, the amount of the capital stock of said company, the term of its existence, not to exceed thirty years, the number of shares of which the said stock shall consist, the number of directors and their names, who shall manage the concerns of said company for the first year; the name of the county in which the business of the said company is to be carried on, and the location of the business office of said company, which shall be within this State.

Sec. 2. When the certificate and duplicate shall have been filed as aforesaid, the persons who shall have signed and acknowledged the same, and their successors, shall be a body politic and corporate in fact and in name, by the name stated in such certificate, and by that name have succession, and shall be capable of suing and being sued in any court in this State, and may have a common seal, and make and alter the same at pleasure; and they shall by their corporate name be capable in law of purchasing, holding and conveying any real and personal estate whatever, which may be necessary to enable said company to carry on the business named in such certificate; but shall not mortgage the same or give any lien thereon. It may and shall be lawful for the individuals associated for the purpose of organizing any company under this act, after having filed a certificate of incorporation, as required in the preceding section, to open books for subscription to the capital stock of the company so organized, and to keep the same open until the full amount specified in such certificate is subscribed. (The copy of any certificate of incorporation filed in pursuance of this act, certified by the county clerk or Secretary of State to be a true copy of the whole of such certificate, shall be received in all courts and places as presumptive legal evidence of the facts therein stated.)

Sec. 3. The stock, property and business of such corporation shall be managed by not less than three nor more than nine directors, who shall be stockholders in such corporation, and citizens of the United States, and a majority of them shall be citizens of this State, who shall, except for the first year, be annually elected by the stockholders at the business office of said corporation, at such time as the by-laws of said corporation shall

provide; and public notice of the time and place of holding such election shall be published not less than thirty days previous thereto, in some newspaper printed in the city of Detroit; and the election shall be made by the stockholders that shall attend such meeting, either in person or by proxy. All elections shall be by ballot, and each stockholder shall be entitled to as many votes as he holds shares of stock in such corporation; and the persons receiving the greatest number of votes shall be directors; and when any vacancy shall happen among the directors, it shall be filled in such manner as the by-laws of such corporation may provide.

Sec. 4. In case it shall happen that an election of directors shall not be made on the day designated by the by-laws of any such corporation for the election, the corporation for that reason shall not be dissolved; but it shall be lawful to hold an election on any other day, in such manner as shall be provided for by the said by-laws; and all acts of directors shall be valid and binding against any such corporation until their successors shall be elected.

Sec. 5. There shall be a president of the corporation, who shall be designated from the number of directors, and also a secretary and such other subordinate officers as the company by its by-laws may designate, who may be elected or appointed, and required to give such security for the faithful performance of their duties as the corporation by its by-laws may require.

Sec. 6. It shall be lawful for the directors to call in and demand of the stockholders respectively, all such sums of money by them subscribed, at such time, and in such payments or instalments as the directors shall deem proper, under the penalty of forfeiting the shares of stock subscribed for; and all previous payments made thereon, if payment shall not be made by the stockholders in sixty days after a personal notice, or notice requiring such payment, shall have been published for six successive weeks in a newspaper published in the city of Detroit.

Sec. 7. The directors shall have power to make such prudential by-laws as they may deem proper for the subscription to management and disposition of the stock, and such as are necessary

for transacting the business of such company, as stated in the certificate of incorporation, not inconsistent with the laws of this State; also for prescribing the duties of all officers, or persons in the employ of said company, and for the appointment of all such officers.

Sec. 8. All stockholders of every company incorporated under this act, shall be individually liable to the creditors of the company in which they are stockholders, to an amount equal to the amount of stock held by them, respectively, for all debts and contracts made by such company while they were stockholders, until the whole amount of capital stock fixed and limited by the certificates of incorporation of such company shall have been paid in, and a certificate thereof shall have been made and recorded as prescribed in the following section, and at least five per cent. of the capital stock so fixed shall be paid in before filing the certificate of incorporation of such company, and at least five per cent. within one year from the time of filing said certificate; and at least ten per cent. annually within each year thereafter, so long as the requirements of such corporation shall render it necessary, or until the whole amount of capital so fixed shall be paid in, or such corporation shall be dissolved.

Sec. 9. The president and a majority of the directors of every such corporation, within thirty days after the payment of the last instalment of the capital stock as fixed and limited by the certificate of incorporation, shall make a certificate stating the amount of capital stock so fixed and paid in, which certificate shall be signed and sworn to by the president and a majority of the directors, and they shall, within the said thirty days, cause the same to be recorded in the office of the county clerk, in a book to be provided for the record of all matter in relation to corporations required to be recorded in the county in which the business of such corporation is carried on.

Sec. 10. The stock of any such corporation shall be deemed personal estate, and shall be transferable in such manner as shall be prescribed by the by-laws of the company; but no transfer shall be valid except between the parties thereto, until the same shall have been entered upon the books of the corporation, as to

show the names of the parties by and to whom transferred, the number and designation of the shares and the date of the transfer; and no shares shall be transferable until all previous calls or assessments thereon shall have been fully paid in, or shall have been declared forfeited for the non-payment of calls thereon. It shall not be lawful for any such corporation to use any of the funds in the purchase of, or in any manner to purchase stock in any other corporation.

Sec. 11. Every such corporation shall annually, within ten days from the first day of January, make a report which shall state the amount of capital and the amount actually paid in, the investment of any portion of the earnings of such company in its business, the whole amount of money which has at any time been borrowed, and then remaining unpaid, and the amount of its existing debts, exclusive of borrowed money, whether acknowledged or contested, designating each, and specifying the name and amount due each creditor; also stating the number of acres and legal subdivisions of all lands owned, and of all lands in possession of any such company, and the location of the business office of such company, if any change has been made, which report shall be signed by the president and a majority of the directors, and shall be verified by the oath of the president or secretary of such corporation, and filed in the office of the clerk of the county in (which) the business of any such company is carried on, and a duplicate thereof in the office of Secretary of State; and if any such company shall fail so to do, all the directors thereof shall be jointly and severally liable for all the debts of the company then existing, and that shall be contracted before such report shall be made.

Sec. 12. All corporations formed under the provisions of this act shall pay to the Treasurer of the State of Michigan an annual tax of one per cent. on the whole amount of capital actually paid in, and any investment of the earnings of any such company in their business shall be considered as so much capital paid in; also upon all sums of money at any time borrowed by any such company and then remaining unpaid, in whole or in part; which tax shall be paid on the first Monday of February in each year,

and shall be estimated upon the report of such company for that year, made as required by section eleven of this act, and such tax shall be in lieu of all State taxes, upon the real and personal estate of such company.

Sec. 13. If the directors of any such company shall declare or pay any dividend when the company is insolvent, or any dividend the payment of which would render it insolvent, or which would diminish the amount of its capital stock, they and all the stockholders who shall accept or receive such dividend, shall be jointly and severally liable for all the debts of said company then existing, and for all that shall be thereafter contracted while they respectively continue stockholders or in office. If any certificate or report made, or public notice given by the officers of any such corporation, in pursuance of the provisions of this act, shall be false in any material representations, all the officers who shall have signed the same, and the president and directors, shall be jointly and severally liable for all the debts of the company then existing, or which shall be contracted while they are stockholders and officers thereof: *Provided*, That if any of the directors shall object to the declaring of any dividend, or to the payment of the same, and shall at any time before the time fixed for the payment thereof, file a certificate of their objection with the secretary of the company, and in the office of the clerk of the county in which the business of said corporation is carried on, they shall be exempt from said liability; and any officer or director who shall within ten days of the making of any certificate or report, or the giving of any public notice, make a counter certificate or report, or give a counter public notice, shall be exempt from any such liability.

Sec. 14. No person holding stock in any such corporation as executor, administrator, guardian or trustee, (unless they receive a dividend, as in the preceding sections, in which case they shall be liable,) and no person holding such stock as collateral security, shall be personally subject to any such liability as stockholders of such company; but the person pledging the stock shall be considered as holding the same, and shall be liable as a stockholder accordingly, and the estates and funds in the hands of such executor, administrator, guardian or trustee, except as

the testator or intestate, or the ward or person interested in such trust fund would have been, if living and competent to act and held the stock in his own name. Every such executor, administrator, guardian or trustee shall represent the shares of stock in his hands, at all meetings of the company, and may vote accordingly as a stockholder; and every person who shall pledge his stock as aforesaid may nevertheless represent the same at all meetings, and may vote accordingly as a stockholder.

Sec. 15. Any company which may be formed under this act may increase or diminish its capital stock by complying with the provisions of this act, to any amount which may be deemed sufficient and proper for the purposes of the corporation. But before any corporation shall be entitled to diminish the amount of its capital stock, if the amount of its debts and liabilities shall exceed the amount of capital to which it is proposed to be reduced, such amount of debts and liabilities shall be satisfied and reduced so as not to exceed such diminished amount of capital.

Sec. 16. Whenever any company shall desire to call a meeting of stockholders, for increasing or diminishing the amount of its capital stock, or for extending or changing its business, it shall be the duty of the directors to publish a notice, signed by at least a majority of them, in a newspaper published in the city of Detroit, at least three successive weeks, and to deposit a written or printed copy thereof in the post office, addressed to each stockholder, at his usual place of residence, at least three weeks previous to the day fixed upon for holding such meeting, specifying the object of the meeting, the time and place, (which shall be at the business office of such company,) when and where such meeting shall be held, and the amount to which it shall be proposed to increase or diminish the capital, and the business to which the company would be extended or changed; and a vote of at least two-thirds of all the shares of stock shall be necessary to an increase or diminution of the amount of its capital stock.

Sec. 17. If at any (the) time and place specified in the notice, provided for in the preceding section of this act, stockholders shall appear in person or by proxy, in number representing not less than two-thirds of all the shares of stock of the corporation,

they shall organize by choosing one of the directors chairman of the meeting, and also a suitable person for secretary, and proceed to a vote of those present in person or by proxy ; and if, on canvassing the votes it shall appear that a sufficient number of votes have been given in favor of increasing or diminishing the amount of capital, or of extending or changing its business as aforesaid, a certificate of the proceedings showing a compliance with the provisions of this act, the amount of capital actually paid in, the business to which it is extended or changed, the whole amount of debts and liabilities of the company, and the amount to which the capital stock shall be increased or diminished, shall be made out, signed and verified by the affidavit of the chairman of such meeting, and the president of such company, and be countersigned by the secretary of such meeting and the secretary of the company, and such certificate shall be acknowledged by the chairman and president, and filed as required by the first section of this act, and when so filed the capital stock of such corporation shall be increased or diminished to the amount specified in such certificate, and the business extended or changed as aforesaid, and the company shall be entitled to the privileges and provisions, and be subject to the liabilities, of this act as the case may be.

See. 18. It shall be the duty of the directors of the corporation, to cause a book to be kept at the business office of such company by the treasurer or secretary thereof, and also by the agent of such company, residing in the city of Detroit, at his known place of residence or business office, or at the office of the clerk of the county of Wayne, containing the names of all persons alphabetically arranged, who are or shall within six years have been stockholders of such company, and showing their places of residence, the number of shares of stock held by them respectively, the time when they respectively became the owners of such shares, the amount of stock actually paid in, the number of acres and legal subdivisions of all lands owned, and all lands in possession of such company, and the names and places of residence of the president, secretary, and directors of such corporation ; which books shall be kept open for the inspection of stockholders and creditors of such company, and their

personal representatives; and any and every such stockholder, creditor or representative shall have a right to make extracts from such book; and no transfer of stock shall be valid for any purpose whatever, except to render the person to whom it shall be transferred liable for the debt of such company, according to the provisions of this act, until it shall have been entered therein, as required in this section, by an entry showing to and from whom transferred. Such book or books shall be presumptive evidence of the facts therein stated, in favor of the plaintiff, in any suit or proceeding against such company, or against any one or more stockholders. Every officer, or agent of such company, who shall fail or neglect to make any proper entry in such book, or shall neglect or refuse to exhibit the same, or allow the same to be inspected, and extracts taken therefrom, as provided by this section, shall be deemed guilty of a misdemeanor, and the company shall forfeit and pay to the party injured, a penalty of fifty dollars for every such neglect or refusal, and all damages resulting therefrom; and every company that shall neglect to keep such books open for inspection as aforesaid, shall forfeit and pay to the people the sum of fifty dollars for every day it shall so neglect, to be sued for and recovered in the name of the people by the prosecuting attorney of the county in which such penalty is incurred; and when so recovered, the amount shall be paid into the treasury of such county, for the use of township libraries in such county, in the same manner as is or shall be provided for the application of fines and penalties for the breach of other personal laws.

Sec. 19. If the indebtedness of any such corporation shall at any time exceed the amount of its capital stock, the directors of such company shall be individually and personally liable for all the debts of such company then existing, or which shall be contracted while they severally remain in office. No corporation formed under the provisions of this act shall at any one time own or hold more than twelve hundred and eighty acres of land, in legal subdivisions; and no such corporation shall be permitted to purchase or hold any real estate, except such as shall be necessary for the exercise of its corporate franchises.

Sec. 20. The copy of any certificate, (other than the certificate of incorporation,) or report filed or made in pursuance of this act, certified by the secretary of state, or any county clerk, to be a true copy; and of the whole of such certificate or report, filed or recorded in his office, shall be received in all courts and places as presumptive legal evidence of the facts therein stated, as against such company, its officers and stockholders.

Sec. 21. Service of any legal process against any such corporation, may be made on the president or secretary, or if neither of them can be found in the county, then upon any one of the directors of such company; and in case neither of the above named officers can be found in the county, then such service may be made by leaving a copy of such process at the business office of such company, in some conspicuous place.

Sec. 22. All companies formed under this act, and doing business in the upper peninsula of this state, shall at all times have an agent residing in the city of Detroit, upon whom service of legal process may at any time be made, which shall be as valid as if made on any of the officers of such company. A certificate in writing of the appointment of such agent shall be filed in the office of the county clerk of the county of Wayne; and if no such agent shall be appointed, or if neither such agent nor the president, secretary, or a director of any such company shall be found in the county of Wayne, then service of such process may be made by posting up a copy thereof in some conspicuous place in said clerk's office; and suit may be brought against any such company in the county of Wayne, as well as in any county in the upper peninsula.

Sec. 23. Nothing but money shall be considered as payment of any part of the capital stock; and no loan of money shall be made by any such corporation to any stockholder therein; and if any such loan shall be made to a stockholder, such stockholder, and the officers of such company, shall be jointly and severally liable for all the debts of the company contracted before the repayment of the sum so loaned. Any officer of any such corporation who shall loan, or any stockholder who shall borrow any money as above provided, or any officer of any such company who shall create any indebtedness against such company, not

authorized by the by-laws, shall be deemed guilty of a misdemeanor.

Sec. 24. The legislature may at any time alter, amend or repeal this act, but such alteration or amendment shall not operate as an alteration or amendment of the corporate rights of companies formed under it, unless expressly named in the act so altering or amending this act; but such alteration, amendment, annulling or repeal shall not, nor shall the dissolution of any such company, take away or impair any remedy given for or against any such corporation, its stockholders, or officers, for any liability which shall have been previously incurred.

Sec. 25. No stockholder shall be personally liable for any debt contracted by any company under this act, except for all labor performed for such corporations, unless a suit for the collection of such debt shall be brought against such company, within one year after such debt shall become due; and no suit shall be brought against any stockholder in any such company until an execution against such company shall have been returned unsatisfied in whole or in part; and such stockholders shall be severally and individually liable for all costs on any judgment rendered against such corporation.

Sec. 26. Any stockholder who may have paid any of such company, either voluntarily or by compulsion, shall have a right to sue and recover of such company the full amount thereof, with interest and all costs and expenses. And any such stockholder who may have paid as heretofore, shall have a right to bring an action against and recover of the rest of the stockholders, or any one or more of them, the due proportion thereof which such stockholder or stockholders ought to pay; and if such action for contribution shall be brought against more than one stockholder, the judgment and the execution thereon shall specify the amount to be recovered and collected from each defendant.

Sec. 27. This act shall take effect immediately.

Approved, April 8th, 1851.

AN ACT

To amend section three of an Act entitled, An Act to authorize the formation of Corporations, for mining, smelting or manufacturing iron, copper or silver ores.

Section 1. The people of the State of Michigan enact, that section three of the act entitled "An act to authorize the formation of corporations for mining, smelting or manufacturing iron, copper or silver ores," approved April eighth, eighteen hundred and fifty-one, be amended so that the section as amended will read

Sec. 3. The stock, property and business of such corporation shall be managed by not less than three nor more than nine directors, who shall each be stockholders in such corporation and citizens of the United States, and one-third of them shall be citizens of this State, who shall, except for the first year, be annually elected by the stockholders at the business office of the said corporation at such time as the by-laws of said corporation shall provide; and public notice of the time and place of holding such election, shall be published not less than thirty days previous thereto, in some newspaper printed in the city of Detroit; and the election shall be made by the stockholders that shall attend such meeting, either in person or by proxy. All elections shall be by ballot, and each stockholder shall be entitled to as many votes as he holds shares of stock in such corporation, and "the persons receiving the greatest number of votes shall be directors; and when any vacancy shall happen among the directors it shall be filled in such manner as the by-laws of such corporation may provide."

Sec. 2. This act shall take effect immediately.

Approved, June 28, 1851.

L A K E S U P E R I O R



Geological Map of
KEWEENAW POINT,
Lake Superior, Michigan.

J.W. FOSTER & J.D. WHITNEY, U.S. GEOLOGISTS,
S.W. HILL & W. SCHLATTER, ASSISTANTS.